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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/618,262	07/11/2003	Gregory Allen Sotzing	UCT-0048	3919
23413	7590	08/02/2005	EXAMINER	
CANTOR COLBURN, LLP 55 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002			WONG, EDNA	
		ART UNIT	PAPER NUMBER	
		1753		

DATE MAILED: 08/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/618,262	SOTZING, GREGORY ALLEN	
	Examiner	Art Unit	
	Edna Wong	1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on ____.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-17 is/are pending in the application.
 - 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) Claim(s) ____ is/are allowed.
- 6) Claim(s) 1-17 is/are rejected.
- 7) Claim(s) ____ is/are objected to.
- 8) Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on ____ is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. ____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date January 12, 2004.
- 4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) Notice of Informal Patent Application (PTO-152)
- 6) Other: ____.

Specification

The disclosure is objected to because of the following informalities:

page 1, line 3, the year "2001" should be amended to the year -- 2002 --.

page 12, line 6, the words "(Figure 1)" should be deleted. There is no Figure 1.

page 14, line 8, it is unclear what is meant by "heated up to 7000".

Appropriate correction is required.

Claim Objections

I. Claims 1 and 15 are objected to because of the following informalities:

Claim 1

line 1, the word "electrochemical reaction" should be amended to the words -- electrochemically reacting --.

Claim 15

line 3, "R₁ and R₂" should be amended to -- R¹ and R² --.

Appropriate correction is required.

II. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 8-18 been renumbered 7-17.

Claim Rejections - 35 USC § 112

Claims 1-17 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 1

line 3, it appears that the "thieno[3,4-b]thiophene" is the same as that recited in claim 1, line 2. However, it is unclear if it is. If it is, then it is suggested that the word -- the -- be inserted after the word "from".

Claim 2

line 1, it appears that the "electrochemical reaction" is the same as that recited in claim 1, line 1. However, it is unclear if it is. If it is, then it is suggested that the word -- the -- be inserted after the word "wherein".

Claim 5

line 1, it appears that the “reaction” is the same as the electrochemical reaction recited in claim 1, line 1. However, it is unclear if it is. If it is, then it is suggested that the word -- the -- be inserted after the word “wherein”.

Claim 11

line 7, “(i.e., F, Cl, Br, I)” is indefinite. It is unclear if the narrower limitation is, in fact, a claim limitation.

Claim 14

lines 1-2, if X is required to be a C₁-C₄ alkylene or substituted C₁-C₄ alkylene as recited in parent claim 13, line 3, it is unclear how X is C₁-C₁₂ alkyl- or C₆-C₁₂ phenyl-substituted ethylene, or a 1,2-cyclohexylene.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

I. Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Neef

et al. ("Synthesis and Electronic Properties of Poly(2-Phenylthieno[3,4-b]Thiophene: A New Low Band Gap Polymer", *Chem. Mater.*, Vol. 11 (1999), pp. 1957-1958).

Neef teaches a process comprising electrochemical reaction of a monomeric composition comprising 2-phenylthieno[3,4-b]thiophene, to form a polymeric composition comprising units derived from 2-phenylthieno[3,4-b]thiophene (page 147, "Electronic Properties"; and Figure 3).

The electrochemical reaction is in an electrochemical cell comprising an electrolyte (= a tetramethylammonium triflate/acetonitrile solution), a working electrode (= a Pt button working electrode), a counter electrode (= a carbon counter electrode), and a reference electrode (= a Ag/Ag⁺ reference electrode) in operable communication (page 1958; and Figure 3).

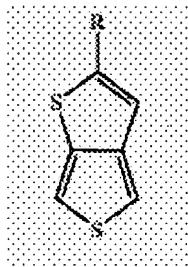
The working electrode is a platinum, gold, or vitreous carbon working electrode (= a Pt button working electrode) [page 1958].

The reaction provides the polymeric composition on an indium tin oxide substrate (= ITO-coated Mylar) [page 1958; and Figure 4].

The process further comprises reducing the polymeric composition (Figure 3).

The polymeric composition has a band gap of about 0.85 V (page 1958).

The co-monomer is



wherein R is C₁-C₁₂ primary, secondary or tertiary alkyl, cycloalkyl, C₆-C₃₆ aryl, or a functional group (= 2-phenylthieno[3,4-b]thiophene) [page 1958].

The process of Neef differs from the instant invention because Neef does not disclose the following:

- a. Wherein the monomeric composition comprises thieno[3,4-b]thiophene, as recited in claim 1.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the monomeric composition disclosed Neef with wherein the monomeric composition comprises thieno[3,4-b]thiophene because one having ordinary skill in the art would have recognized that the specie of thieno[3,4-b]thiophene would have been an equivalent to the specie of 2-phenylthieno[3,4-b]thiophene because they are from the same genus.

- b. Wherein the counter electrode is platinum, as recited in claim 3.

The invention as a whole would have been obvious to one having ordinary skill in

the art at the time the invention was made to have modified the carbon counter electrode disclosed Neef by replacing it with a platinum counter electrode because a platinum counter electrode appears to be a mere optimization which solves no stated problems and produces no unexpected results, unless proven otherwise.

c. Wherein the working electrode is a vitreous carbon electrode and the electrolyte is tetrabutylammonium perchlorate/acetonitrile, as recited in claim 4.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the Pt button working electrode and the tetramethylammonium triflate/acetonitrile solution disclosed Neef by replacing them with a vitreous carbon working electrode and a tetrabutylammonium perchlorate/acetonitrile electrolyte because a vitreous carbon working electrode and a tetrabutylammonium perchlorate/acetonitrile electrolyte appear to be a mere optimization which solves no stated problems and produces no unexpected results, unless proven otherwise.

d. Wherein the polymeric composition is transparent, as recited in claim 8.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada*

15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

e. Wherein the polymeric composition has no observable color in the oxidized form, as recited in claim 9.

The invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because similar processes can reasonably be expected to yield products which inherently have the same properties. *In re Spada* 15 USPQ 2d 1655 (CAFC 1990); *In re DeBlauwe* 222 USPQ 191; *In re Wiegand* 86 USPQ 155 (CCPA 195).

II. Claims 10-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Neef et al.** ("Synthesis and Electronic Properties of Poly(2-Phenylthieno[3,4-b]Thiophene: A New Low Band Gap Polymer", *Chem. Mater.*, Vol. 11 (1999), pp. 1957-1958) as applied to claims 1-9 above, and further in view of **Lazzaroni et al.** (US Patent No. 4,663,001).

Neef is as applied above and incorporated herein.

The method of Neef differs from the instant invention because Neef does not disclose wherein the monomeric composition further comprises a co-monomer reactive with the thieno[3,4-b]thiophene, as recited in claim 10.

However, Lazzaroni teaches that electroconductive polymers based on mixtures of monomers depend on the properties desired in the resultant copolymers (col. 3, lines 33-50).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Neef by with wherein the monomeric composition further comprises a co-monomer reactive with the thieno[3,4-b]thiophene because electroconductive polymers based on mixtures of monomers are conventional in the art depending on the electrical and mechanical properties desired in the resultant copolymers as taught by Lazzaroni (col. 3, lines 33-50).

b. Wherein the co-monomer is a thiophene, substituted thiophene, substituted thieno[3,4-b]thiophene, dithieno[3,4-b:3',4'-d]thiophene, bithiophene, pyrrole, substituted pyrrole, phenylene, substituted phenylene, naphthalene, substituted naphthalene, biphenyl, substituted biphenyl, terphenyl, substituted terphenyl, phenylene vinylene, substituted phenylene vinylene, or a combination comprising at least one of the foregoing co-monomers, wherein the substituents are one or more of -H, hydroxyl, C₆-C₃₆ aryl, C₃-C₆ cycloalkyl, C₁-C₁₂ alkyl, halogen (i.e., F, Cl, Br, I), C₁-C₁₂ alkoxy, C₁-C₁₂ alkylthio, C₁-C₁₂ perfluoroalkyl, C₆-C₃₆ perfluoroaryl, pyridyl, cyano, thiocyanato, nitro, amino, C₁-C₁₂ alkylamino, C₁-C₁₂ aminoalkyl, acyl, sulfoxyl, sulfonyl, amido, and/or

carbamoyl, as recited in claim 11.

However, Lazzaroni teaches that possible comonomers are aromatic and heterocyclic comonomers having 5 to 6 members, such as aniline, pyrrole, thiophen (and their substituted derivatives) and vinyl monomers such as acrylonitrile and acrylamide. It is understood that the possible content of the copolymer in the polymerization medium must be determined experimentally, in such a way as to avoid any deterioration of the electrical and mechanical properties of the polymer (col. 3, lines 33-50).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Neef with wherein the co-monomer is a thiophene, substituted thiophene, substituted thieno[3,4-b]thiophene, dithieno[3,4-b:3',4'-d]thiophene, bithiophene, pyrrole, substituted pyrrole, phenylene, substituted phenylene, naphthalene, substituted naphthalene, biphenyl, substituted biphenyl, terphenyl, substituted terphenyl, phenylene vinylene, substituted phenylene vinylene, or a combination comprising at least one of the foregoing co-monomers, wherein the substituents are one or more of -H, hydroxyl, C₁-C₆ aryl, C₃-C₆ cycloalkyl, C₁-C₁₂ alkyl, halogen (i.e., F, Cl, Br, I), C₁-C₁₂ alkoxy, C₁-C₁₂ alkylthio, C₁-C₁₂ perfluoroalkyl, C₆-C₃₆ perfluoroaryl, pyridyl, cyano, thiocyanato, nitro, amino, C₁-C₁₂ alkylamino, C₁-C₁₂ aminoalkyl, acyl, sulfoxyl, sulfonyl, amido, and/or carbamoyl because possible comonomers are aromatic and heterocyclic comonomers

having 5 to 6 members, such as aniline, pyrrole, thiophen (and their substituted derivatives) and vinyl monomers such as acrylonitrile and acrylamide as taught by Lazzaroni (col. 3, lines 33-50).

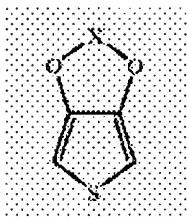
However, the comonomer is a result-effective variable and one skilled in the art has the skill to determine the commoner that would give the desired electrical and mechanical properties of the polymer, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

III. Claims **13 and 14** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Neef et al.** ("Synthesis and Electronic Properties of Poly(2-Phenylthieno[3,4-b]Thiophene: A New Low Band Gap Polymer", *Chem. Mater.*, Vol. 11 (1999), pp. 1957-1958) as applied to claims 1-9 above, and further in view of **Lazzaroni et al.** (US Patent No. 4,663,001) as applied to claims 10-12 above, and further in view of **Jonas et al.** (US Patent No. 4,959,430) ['430].

Neef and Lazzaroni are as applied above and incorporated herein.

The method of Neef and Lazzaroni differ from the instant invention because they do not disclose the following:

- a. Wherein the co-monomer is:

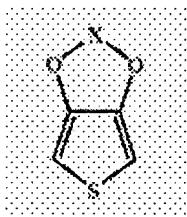


wherein X is C₁-C₄ alkylene or substituted C₁-C₄ alkylene, as recited in claim 13.

b. Wherein X is C₁-C₁₂ alkyl- or C₆-C₁₂ phenyl-substituted ethylene, or a 1,2-cyclohexylene, as recited in claim 14.

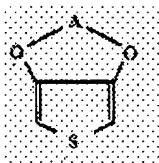
However, Lazzaroni teaches that it is understood that the possible content of the copolymer in the polymerization medium must be determined experimentally, in such a way as to avoid any deterioration of the electrical and mechanical properties of the polymer (col. 3, lines 33-50).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Neef with wherein the co-monomer is:



wherein X is C₁-C₄ alkylene or substituted C₁-C₄ alkylene; or wherein X is C₁-C₁₂ alkyl- or C₆-C₁₂ phenyl-substituted ethylene, or a 1,2-cyclohexylene because the comonomer is a result-effective variable and one skilled in the art has the skill to determine the commoner that would give the desired electrical and mechanical properties of the polymer, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

Jonas '430 teaches the monomer:

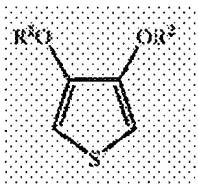


wherein A is an optionally substituted C₁-C₄ alkylene radical (col. 2, lines 44-61).

IV. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over **Neef et al.** ("Synthesis and Electronic Properties of Poly(2-Phenylthieno[3,4-b]Thiophene: A New Low band Gap Polymer", *Chem. Mater.*, Vol. 11 (1999), pp. 1957-1958) as applied to claims 1-9 above, and further in view of **Lazzaroni et al.** (US Patent No. 4,663,001) as applied to claims 10-12 above, and further in view of **Jonas et al.** (US Patent No. 4,910,645) ['645].

Neef and Lazzaroni are as applied above and incorporated herein.

The method of Neef and Lazzaroni differ from the instant invention because they do not disclose wherein the co-monomer is:

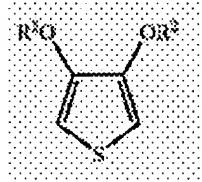


wherein R₁ and R₂ are each independently -H, C₁-C₄ alkyl, phenyl, or substituted phenyl, as recited in claim 15.

However, Lazzaroni teaches that it is understood that the possible content of the

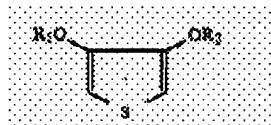
copolymer in the polymerization medium must be determined experimentally, in such a way as to avoid any deterioration of the electrical and mechanical properties of the polymer (col. 3, lines 33-50).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Neef with wherein the co-monomer is:



wherein R₁ and R₂ are each independently -H, C₁-C₄ alkyl, phenyl, or substituted phenyl because the comonomer is a result-effective variable and one skilled in the art has the skill to determine the comonomer that would give the desired electrical and mechanical properties of the polymer, absent evidence to the contrary. MPEP § 2141.03 and § 2144.05(b).

Jonas '645 teaches the monomer:



wherein R₁ and R₂ are each independently -H, C₁-C₄ alkyl, phenyl, or substituted phenyl (col. 2, lines 10-18).

V. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Neef et al.** ("Synthesis and Electronic Properties of Poly(2-Phenylthieno[3,4-b]Thiophene: A New Low Band Gap Polymer", *Chem. Mater.*, Vol. 11 (1999), pp. 1957-1958) as applied to claims 1-9 above, and further in view of **Jonas et al.** (US Patent No. 5,300,575) ['575].

Neef is as applied above and incorporated herein.

The method of Neef differs from the instant invention because Neef does not disclose the following:

a. Wherein the monomeric composition further comprises a polyanion, as recited in claim 16.

However, Jonas '575 teaches that the polythiophenes get positive charges by the oxidative polymerization (col. 3, lines 16-19).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Neef with wherein the monomeric composition further comprises a polyanion because thieno[3,4-b]thiophene would have gotten positive charges by the oxidative polymerization as taught by Jonas '575 (col. 3, lines 16-19). The polyanions would have compensated or neutralized the positive charges.

b. Wherein the polyanion is a polycarboxylate or a polymeric sulfonate, as

recited in claim 17.

However, Jonas '575 teaches that the polyanions are anions of polymeric carboxylic acids and polymeric sulfonic acids (col. 2, lines 45-52).

Thus, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the method of Neef with wherein the polyanion is a polycarboxylate or a polymeric sulfonate because anions of polymeric carboxylic acids and polymeric sulfonic acids are conventional polyanions in polythiophene dispersions. (col. 2, lines 45-52).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (571) 272-1349. The examiner can normally be reached on Mon-Fri 7:30 am to 4:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Edna Wong
Primary Examiner
Art Unit 1753

EW
July 28, 2005